

### **REMARKS**

Claims 1 – 39 and 41 – 75 of the present application are pending. Claim 40 has been cancelled and claims 41 and 51 have been amended. No new matter has been added.

Claims 41 and 51 have been amended to recite specific transition metal halide catalyst. Support for this amendment can be found at page 13 of the original specification.

### **Summary of the Invention As Presently Claimed:**

The present claims are directed to novel methods of producing fluoropropenes, such as HFC-1234ze, via a dehydrohalogenation process. The claimed processes involve using a halopropane, such as HFC-245fa, HFCF-244fa, or HCC-240fa as a reactant.

According to a first aspect of the invention (see claims 1 to 37, 73 and 74), a halopropane is reacted with a caustic *solution* of at least one alkali or alkaline metal hydroxide in a non-aqueous, non-alcoholic solvent that is miscible with the halopropane, at a temperature at which dehydrohalogenation will occur (preferably from about 20° C to about 150° C). This reaction preferably occurs without a catalyst (see for example, claims 1 - 18).

According to a second aspect of the invention, the halopropane is reacted under conditions at which dehydrohalogenation occurs (see claims 38, 39, 41 – 47 and 75) by thermal decomposition (i.e. at about 30° C to about 400° C). The

processes according to these claims may be conducted with or without a catalyst. In embodiments that utilize a dehydrohalogenation catalyst, preferable catalysts include iron halides, nickel halides, cobalt halides, and combinations thereof.

In certain embodiments, the presently claimed methods include a preliminary step wherein the halopropane reactant is synthesized. An example of such a preliminary step is reacting HCC-240fa with HF in the presence of a fluorination catalyst, such as chromium oxides. Applicants acknowledge that processes for preparing certain halopropanes are known in the art (see Specification p. 5, lines 17 – p. 6, line 4). However, the claims as now presented are directed to methods of producing fluoropropenes by a reaction which, in certain instances, may also include a step for preparing halopropane reactants.

**Double Patenting Rejection:**

The Office has rejected claims 1, 5, 7 – 12, 14, 15, and 38 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 7, and 32 of co-pending Application No. 10/671,810.

In response to this rejection, and without conceding the correctness of the Examiner's rejection or the reasoning thereof, Applicants will consider filing, in the event that the pending subject matter is indicated as being allowable, a Terminal Disclaimer wherein Applicants disclaim the terminal part of any patent granted on the present application which would extend beyond the expiration date of a patent granted on Application No. 10/671,810.

**Rejections of Under 35 U.S.C. § 102(b):**

Claims 1, 3, 5, 6, 14 15, 38, 39, and 44 have been rejected under 35 U.S.C. § 102(b) as being anticipated by XP 000578879 (Knunyants).

Specifically, the Office asserts that Kunuyants discloses a process for dehydrofluorinating HFC-245fa using potassium hydroxide in dibutyl ether to obtain HFO-1234ze.

Applicants respectfully traverse this rejection because Knunyants does not teach or even suggest a dehydrofluorination process utilizing a caustic *solution*. The relevant pending claims are directed to a dehydrohalogenation process that includes a caustic *solution* of at least one alkali metal or alkaline earth metal hydroxide in a non-aqueous, non-alcoholic solvent that is essentially miscible with a relevant halopropane. Examples of solvents that form caustic solutions with alkali metal hydroxides, such as KOH, include acetonitrile, diethyl ether, tetrahydrofuran, certain esters, amines, ketones, as well as other compounds.

In contrast to the present invention, Knunyants discloses the use of a KOH / dibutyl ether *suspension*. Although diethyl ether and dibutyl ether are structurally similar, differences in their physical properties are important in that the former uniformly dissolves KOH to form a solution, whereas the later does not dissolve KOH, but instead forms a suspension in which KOH particles are dispersed.

In view of the actual teachings of Knunyants, applicants assert that this reference neither teaches nor suggests the invention as presently claimed.

Claims 41 and 51 have been rejected under 35 U.S.C. § 102(b) as being anticipated by US 6,124,510 (Elsheikh). Specifically, the Office asserts that Elsheikh discloses a process for the dehydrofluorination of HFC-245fa using a chromium-based catalyst.

Applicants respectfully traverse the Office's rejection as being moot in view of Claims 41 and 51 as presently amended. Claims 41 and 51 are now directed to methods utilizing a transition metal halide catalyst, wherein the transition metal is selected from the group consisting of iron, nickel, cobalt, and combinations thereof. Applicants further note that it is established precedent that catalysts are generally considered unpredictable based upon their chemical nature. *Corona Co. v. Dovan*, 276 US 358, 369 (1928). Thus, Elsheikh neither teaches nor suggests the claimed invention.

**Rejections of Under 35 U.S.C. § 103(a):**

Claims 2, 4, 7-13, 16 – 37, 43, 45, 54 – 71, 74, and 75 have been rejected under 35 U.S.C. § 103(a) as being obvious over Knunyants in view of US 5,574,192 (Van Der Puy).

Claims 46 – 50 have been rejected under 35 U.S.C. § 103(a) as being obvious over Knunyants in view of Van Der Puy, and further in view of Elsheikh.

Claims 72 and 73 rejected under 35 U.S.C. § 103(a) as being obvious over Knunyants in view of Van Der Puy, and further in view of US 6,548,719 (Nair).

With respect to claims 2, 4, 7-13, 16 – 37, and 72 – 74, applicants respectfully traverse the Office rejection over Knunyants in view of Van Der Puy, and optionally in view of Nair, because none of these references, either alone or in combination, teach or suggest the use of caustic *solutions* of alkali or alkaline metal hydroxides.

To establish a prima facie case of obviousness, the references, either alone or in combination, must teach or suggest all of the claim limitations. MPEP 2142. As demonstrated above, Knunyant does not disclose the use of caustic solutions of alkali or alkaline metal hydroxides. This deficiency is not overcome by either Van Der Puy or Nair. Since the Office has provided no reference or combination of references that teach all of the applicable claim limitations, applicants respectfully request that the Office withdraw its 103(a) rejection of the above-mentioned claims.

With respect to claims 43, 45 – 50, 54 – 71, and 75, the Office has rejected claims directed to a non-catalytic, thermal reaction but does not cite any references which teach or even suggest such a reaction. That is, the Office attempts to argue that a *non-catalytic, thermal* dehydrofluorination reaction involving a halopropane reactant and fluoropropene product would be obvious in view of the combination of a caustic condensation reaction process (i.e. Knunyants) and *thermal, catalytic* dehydrofluorination reaction involving the same reactant and product (i.e. Elsheikh or Van Der Puy). However, as described in more detail below, such a proposed modification would render the prior art unsatisfactory for its intended purpose. (MPEP 2143.01).

The Office states that Knunyants is “silent with regard to reaction temperature and pressure, and as such, it is presumed that the temperature and pressure were standard; however, Elsheikh teaches ... temperatures from 100 – 600 ° C when using a catalyst”. Notwithstanding the Office’s attempt to connect the Knunyants and Elsheikh disclosures, it is clear that the former is neither directed to, nor suggests, a thermal dehydrofluorination reaction. The only rationale that the Office presents to support its conclusion that it would have been obvious to combine these references is that both of these processes result in a dehydrofluorinated product. Such a combination, however, would not have been obvious to one skilled in the art because one skilled in the art would have been readily recognized that these two reactions are based on entirely different, and somewhat incompatible, mechanisms. That is, it would not have been expected for a caustic condensation reaction to satisfactorily proceed based upon an elevated temperature of the type required for a catalytic thermal dehydrofluorination process, regardless of the fact that both of these reactions are separately capable of producing a halo-olefin.

The fact that these two process cannot be satisfactorily combined is evidence by Elsheikh itself, which teaches a first dehydrofluorination process at a temperature of from 20° to 100° C when using an alcoholic solution of a strong base, and temperatures of from 100° to 600° C when using a catalyst. It is logical that such a distinction in temperatures would not have been made if the process utilizing a basic solution could satisfactorily be performed at the elevated temperatures required of the thermal dehydrofluorination process.

Claims 42, 52, and 53 have been rejected under 35 U.S.C. § 103(a) as being obvious over Elsheikh. Specifically, the Office asserts that Elsheikh mentions the use of chromium-based catalysts for dehydrofluorination reactions and that such catalysts can be used alone or in combination with other co-catalysts such as nickel, cobalt, manganese, or zinc. However, applicants respectfully point out that the only chromium-based catalysts exemplified in Elsheikh is chromium oxide. The pending claims, as currently amended, include the use of transition metal halide catalyst wherein the transition metal is selected from the group consisting of iron, nickel, cobalt, and combinations thereof. Such transition metal halide catalysts are clearly not taught or even suggested by Elsheikh. Moreover, in view of established precedent that catalysts are generally considered unpredictable based upon their chemical nature, *Corona Co.*, 276 US at 369, it is untenable to maintain that one skilled in the art would reasonably expect such transition metal halide catalysts could be successfully interchanged with chromium oxide.

**Conclusion:**

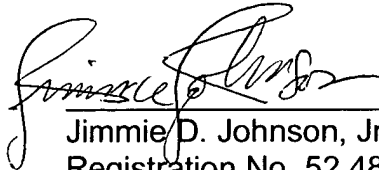
In view of the aforementioned claim amendments and the foregoing remarks, applicants assert that the present claims are in condition for allowance and request that the Office issue a Notice of Allowance at the earliest possible date.

If any fees are required in order to further the prosecution of this application, the Office is invited to charge such fees to Deposit Account No. 19-5425.

The Office is invited to contact the undersigned by telephone in order to further the prosecution of this application in any way.

Respectfully submitted,

Date: Feb. 15, 2006



Jimmie D. Johnson, Jr.  
Registration No. 52,485

Synnestvedt & Lechner LLP  
2600 Aramark Tower  
1101 Market Street  
Philadelphia, PA 19107  
Telephone: (215) 923-4466  
Facsimile: (215) 923-2189